DOCUMENT RESUME

ED 276 238 EC 191 356

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TITLE Teaming the Classroom Computer with a Textbook for Teaching Phonics to Hearing-Impaired Students.
PUB DATE 86
NOTE 31p.; In: Murphy, Harry J., Ed.; Dunnigan, J. A., Ed. Computer Technology and Persons with Disabilities: Proceedings of the Conference (Northridge, California, October 17-19, 1985); see EC 191 351.
PUB TYPE Speeches/Conference Papers (150) -- Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; *Hearing Impairments; *Phonics; Reading Instruction; Secondary Education; *Textbooks

ABSTRACT

The paper describes an approach to teaching phonics to hearing impaired 12-15 year olds through a microcomputer. Under the guidance of a teacher, a standard phonics textbook is paired with phonetic and phonologic practice on the computer. Students proceed through the materials at their own pace. Three phases of learning are featured: (1) exposure to words via pictures from the textbook; (2) participation in computer exercises; and (3) interaction with specially designed crossword puzzles designed to reinforce proper spelling, contextual meaning, word association, and recall. Step by step procedures are described and computer screens pictured. Benefits of the approach, such as increased interest and learning pace are noted. (CL)

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Teaming The Classroom Computer With A Textbook For Teaching Phonics To Hearing-Impaired Students

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The acquisition of speech and language competency is often a slow process for hearing-impaired students. At Kendall Demonstration Elementary School, located on the Gallaudet College campus in Washington, D.C., a number of the 12-to 15-year-old students have speech, language and reading skills at or below the second grade level. This low level of achievement is typically accompanied by a lack of motivation to improve these skills. Experience has shown that students with these characteristics require much individual attention from the teacher if any improvements in sight vocabulary, written language or speech are to be made.

To help alleviate this problem, the classroom computer, operating with software developed by the author, was introduced into the Middle School Speech program. With this software, the computer is applied directly in support of teaching with a standard phonics textbook, **Discovering Phonics We Use** (Arthur W. Heilman; The Riverside Publishing Company, 1981). The computer provides both phonetic and, in conjunction with the teacher, phonologic practice tied to specific areas in the textbook.

This approach requires the student both to analyze the components of a word and to utilize the word in natural language. The student learns that words are made up of vowels and consonants, how to sound out written words as a way of pronouncing and reading, and then learns how the words are used in everyday language. The student proceeds at his/her own pace, and self-directs which activities are to be undertaken at any given time. The teacher's role is to guide and monitor, and to provide individualized instruction as needed. The role of the computer is the following:

* to provide a learning environment in which the student will become self-motivated to progress.
* to raise questions related to the material presented in the textbook.
* to drill the students in the analysis and recognition of consonants and vowel letters, their combination in words and pronunciation.
* to provide a nonthreatening and uncritical instruction/test/evaluation procedure with instant feedback to the student.
* to keep an accurate and unobtrusive score of the students progress and areas needing attention.

Synopsis

The textbook upon which the procedure is based is divided into sections which relate both to skill level and skill type. Each major section of the text is introduced by the teacher to the students in a typical classroom setting. The material is discussed in terms of the objectives and the general procedures to be followed in carrying out the text exercises.

The computer is then introduced. Text exercises, which normally would be performed by the student with pencil and paper, are performed instead using the computer. Instructions presented in the text are paraphrased and supplemented by the computer with each exercise. Since the computer-generated instructions are derived from the text and are in context, they are a valuable supplement to the teacher-generated instructions in the medium of signing/finger spelling.

Each student proceeds through the computer-generated materials at his/her own pace. Many opportunities are provided to the student to end a session without interrupting or shutting off the computer, thereby allowing another student to begin a new session quickly. The computer exercises follow and enhance the text -- an important feature because of the disparity in the text's intended much younger age group than the age of the students.

The learning process proceeds in three phases. First, the student is exposed to words via pictures from one of the textbook pages. These words are related by initial consonants, by final consonants, by vowel sounds, etc. The teacher reinforces the sound/symbol association by articulating the words with emphasis on the component sounds. In the second phase the students are led through various exercises by the computer. These exercises, which correspond to each page in the textbook, cause the student to think about each word in terms of its structure, spelling and meaning. Auditory components of the words are emphasized by the teacher. The computer also provides an opportunity for the student to utilize each word in a sentence. The sentences provide a communication opportunity between the student and his/her peers, as well as the teacher for modifying and expanding grammar and vocabulary. In the third phase, specially designed crossword puzzles are used which are keyed to the words covered in the lesson. The puzzles are presented on the computer screen, with clues provided for each word. They may also be printed on a dot matrix printer. The student responds by entering words horizontally or vertically in the puzzle. The correct puzzle solution is provided at the end of the exercise along with the student's score. The puzzle exercises rein-

force proper word spelling, contextual meaning, word association, and recall (although the student may use the textbook for reference).

Procedure

A computer session is conducted by the student using a hierarchical set of informative displays, menus and question/response screens. The design is such as to minimize the need for teacher intervention, and to be as self-explanatory as possible. A complete set of these screens from an example session is attached at the end of this paper. The following discussion also contains some of these screens as illustrations of the procedure.

The computer software is designed to lead the student through several exercises related to each page of the textbook. No prior knowledge of computer operations is required. When the computer is turned on, it immediately displays an initial identification screen, which is shortly followed by another display identifying the text pages covered. The second display is a menu of text page groups, one of which is to be selected by the student for the session. These two screens appear as follows:





When the student selects one of the page groups, the computer requests the date and student's name to personalize subsequent activities. Another purpose of requesting information from the student is to initiate the beginning of a dialog between the student and the computer via the displays and keyboard. The asking of simple questions of this type helps overcome the initial intimidation felt by first time users as well as offering a nonthreatening hands-on experience with the computer. The students name is repeated to the student from time to time by the computer to emphasize a "user friendly" and personal environment.

After entering his/her name and date, the student is presented with a brief introduction to the objectives of the exercises to come. This introduction is tailored to the specific material presented in the textbook, and, again, is intended to encourage the development of an interactive relationship between the student and the computer. The teacher reads the screen with the student and explains any words or concepts that the student does not understand. An example of this screen is shown below.

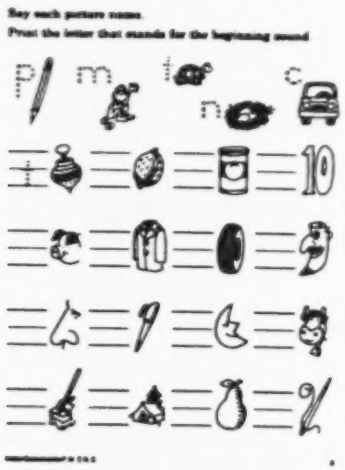


Next, the computer displays the main menu of options which may be

performed. This menu may require some initial explanation by the teacher before the student can fully understand the options presented. The first option, "directions," provides a display of instructions for the uninitiated student. The second option, "work in my book," is selected by a student who is ready to proceed with the exercises pertaining to a specific page in the textbook. The third option, "see my score," displays the student's score from the exercises. The forth option, "quit," ends the session. The fifth option, "order of items," allows the teacher or student to cause the computer to select questions during the exercises in a repetitive sequence (the default choice if Option 5 is not selected) or randomly. The sixth option, 6, "answer keys," provides the correct spelling of all of the vocabulary used in each exercise. This option provides opportunities for auditory training, e.g., find the word, speech reading, sight word vocabulary, sign language practice, and speech drills. The menu and the display of directions resulting from the selection of Option 1 are shown below.

```
%%%
```

containing four pictures per row. This coding of pictures by row and column position is used throughout the exercises.

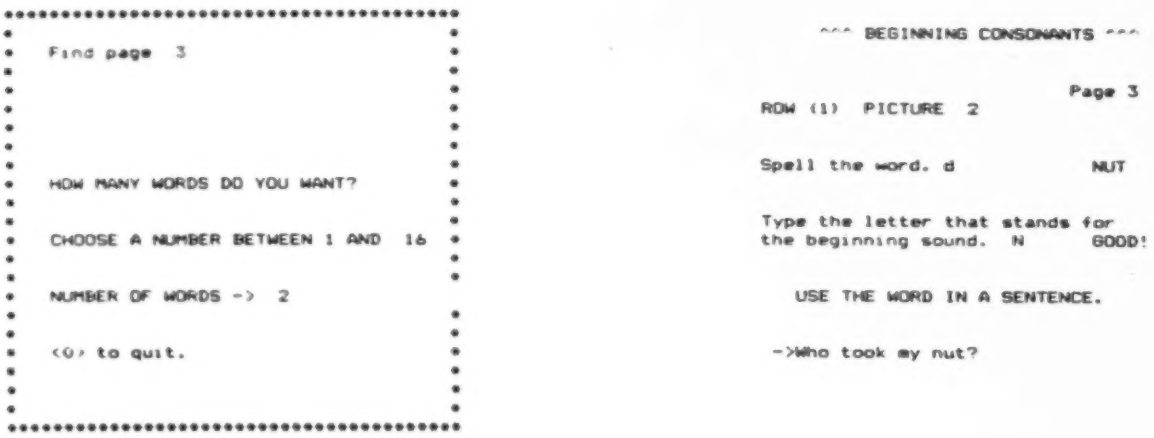


The menu display reappears after the directions screen. If the student were then to choose option 2, "work in my book," a display of specific page options to choose would then appear. This display allows the student to select the exact page in the textbook in which to work. The display is shown below.

```
????????????????????????????????????????????????
?                                              ?
?       <<< PAGE SELECTION >>>                 ?
?                                              ?
?                                              ?
?  1.  PAGE 3                                  ?
?                                              ?
?  2.  PAGE 4                                  ?
?                                              ?
?  3.  PAGE 5                                  ?
?                                              ?
?  4.  PAGE 6                                  ?
?                                              ?
?  5.  PAGE 7                                  ?
?                                              ?
?  6.  PAGE 8                                  ?
?                                              ?
?  Which page do you want?                     ?
?                                              ?
?  CHOOSE A NUMBER (1,2,3,4,5,6)-> 6           ?
?                                              ?
?  Which PAGE did you choose? 8
????????????????????????????????????????????????
```

After selecting the textbook page, the student is then presented with the choice of how many of the words illustrated on the chosen page are to be included in this particular exercise. In the following

illustration, the student has selected two words on page 3 of the textbook. The computer then responds with the question/response screen shown below.



The student examines, in this example, the second picture in row one on page 3 of the textbook [Row (1) Picture (2)], and decides how to spell the word. The spelling of the word is entered on the keyboard, and the computer verifies the entry. If the spelling is incorrect ("d" instead of "nut" in the example), the computer responds with the correct spelling before continuing. If the spelling is correct, the computer responds with "good." The computer then asks for the letter representing the beginning sound. In this simple example the beginning sound is represented by a single letter ("N"), but in later, higher level exercises the sound may require more than one letter.

If the student's answers up to this point are correct, the computers with "good!" and asks the student to enter a sentence containing the word. The sentence response area has three lines of space for keyboard entry. This space may be used for writing sentences, presenting speech drills by the teacher, spelling practice by the student, or

any other text entry activity.

The above example and discussion apply to a very basic level exercise, in this case beginning consonants. As the student progresses, the exercises grow in sophistication as shown below, in the case of vowel sounds. In this instance the computer has asked for the number of vowel letters in the word presented by the picture in the textbook. The correct response given, the computer then requests the number of vowel sounds in the word, and, for the first vowel, whether it is long or short. As in the first example, the student is then asked to use the word in a sentence.

```
        *** VOWEL SOUNDS ***

                          Page 73
ROW (1)  PICTURE 1
Spell the word. X              CHAIN
Number of vowel LETTERS? X              2
Number of vowel SOUNDS? X               1
FIRST vowel (long or short)? X     LONG
Type the vowel letters. X           AI
  *** USE THE WORD IN A SENTENCE ***
 -> I LOST MY CHAIN.

GOOD
   (ESC) to QUIT -  (RETURN) for more
```

```
      *** LONG VOWEL SOUNDS! ***

Can you spell the long vowel sounds?



Long A  a+e  ai  ay
Long E  e+e  ee  ea
Long I  i+e  ie  _y
Long O  o+e  oa  ow  oe  _o
Long U  u+e  ui  ue  oo  oe
Short  _a_  _e_  _i_  _o_  _u_
```

At this point the student may end the exercise and return to the main menu, or continue with another exercise. If the student elects to end the exercise, he/she may then choose to review the answers to the questions posed in the exercises. An example answer key displayed by the computer is shown below. This answer key indicates the correct spelling for each of the pictures found on the chosen page in the textbook.





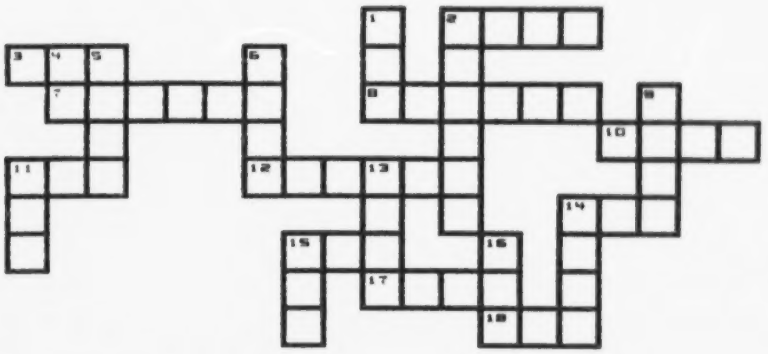
The student may also review his/her score. An example display of the cumulative score for the session is the following.





Additional language enhancement is provided by means of computer-generated crossword puzzle exercises. These exercises continue with the words and relationships covered in the previous question/response exercises. A puzzle is organized to challenge the student to recall words from the earlier exercises, using clues provided with the puz-

zle. A blank puzzle is presented on the computer screen with the clues at the bottom, as shown below. The student fills in the puzzle on the screen using the keyboard, and then the computer validates this input.



ACROSS CLUES

2. Something you wear at Halloween.
3. A kind of toy.
7. Something to sew with.
8. Something to write with.
10. Part of your face.
11. Something to drive.
12. An animal with a hard shell.
14. I bought a ___ of tomatoes.
15. Something to write with.
17. Part of a car.
18. Squirrels like to eat me.

DOWN CLUES

1. Something to clean the floor.
2. An animal that likes to eat bananas.
4. The answer is ON.
5. A fruit. Something to eat.
6. A bird lives in a ___.
9. It shines at night.
11. An animal. It says,"Moo".
13. Something to sleep inside of. I slept in a ___ at camp.
14. Clothing. Something to wear when it is cold.
15. An animal. It says,"oink".
16. A number. 1,2,3, _ _ _ _ _ _ _.

WORD LIST: B PAGE 3

CAR
CAN
COW
COAT
MASK
MOP
MONKEY
MOON
NEEDLE
NEST
NOSE
NUT
ON
PENCIL
PEN
PEAR
PIG
TENT
TEN
TIRE
TOP
TURTLE

ANSWERS: B PAGE 3



Results

The results of applying the computer in this way have been very rewarding. Benefits of this approach include increased student interest in the task at hand, a faster learning pace and better retention of the material by the students, peer support in performing exercises correctly, and positive social interaction. Other benefits include a marked improvement in teacher productivity and, as a by-product, the exposure of the students to computers and keyboard interaction.

Discussion

"Phonics" is the application of phonetics to the teaching of reading. Using the phonics approach means to use the sounds made in speech and the pronunciation of words and syllables as part of the teaching of the meaning and use of words. This is the approach of the computer application described above. Pictures are used to represent words in the textbook. A word is analyzed from the point of view of vowels and consonants, and correct spelling. It is then "sounded out" based upon its components. The next step is the utilization of the word in a signed or verbal sentence. Finally, practice is provided in the use and spelling of the word via crossword puzzle games.

Teaching with phonics is important for hearing-impaired students. Hearing students have the advantage of hearing words in everyday speech which, together with reading, augments the understanding of word usage and increases vocabulary. Without this advantage, hearing-impaired students are limited to the visual impression of word symbols. Phonics, as applied through the computer application described above, is multi-sensory in its approach. Students verbalize the words. They visualize the words through pictures of the words in the textbook, and

the printed form on the computer screen. They associate the symbols and the sounds of the words. And they involve their motor skills as they type the letters of the word in response to the computer queries. This variety of learning modes significantly enhances the students interest, holds and maintains his/her attention, and increases the motivation to learn.

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APPENDIX

DISCOVERING PHONICS WE USE

LEVEL B

BY SANDRA HART-DAVIS

KENDALL DEMONSTRATION SCHOOL
FOR THE DEAF
GALLAUDET COLLEGE

1985

LEVEL B

(1). PAGES 3-4-5-6-7-8

(2). PAGES 9-10-11-12-13

(3). PAGES 17-38

(4). PAGES 39-66

(5). PAGES 73-94

(6). PAGES 95-116

MAKE SELECTION (1 TO 6) ->
LOADING, PLEASE WAIT

LEVEL B

DISCOVERING PHONICS WE USE

(Pages 3,4,5,6,7,8)

DEVELOPED BY SANDRA HART-DAVIS

@ D & H ASSOCIATES

10/17/85

DEAR SANDY

These lessons are about beginning consonants. You will learn about the SOUNDS--pmtcn,blkdf,sgrhw,and vzjqu. All those letters are called CONSONANTS.

XXX HAVE FUN! XXX

```
%%%
```

```
>>>
```

```
????????????????????????????????????????????
?                                              ?
?        <<< PAGE SELECTION >>>                ?
?                                              ?
?                                              ?
?  1.  PAGE 3                                  ?
?                                              ?
?  2.  PAGE 4                                  ?
?                                              ?
?  3.  PAGE 5                                  ?
?                                              ?
?  4.  PAGE 6                                  ?
?                                              ?
?  5.  PAGE 7                                  ?
?                                              ?
?  6.  PAGE 8                                  ?
?                                              ?
?  Which page do you want?                     ?
?                                              ?
?  CHOOSE A NUMBER (1,2,3,4,5,6)-> 1
?                                              ?
?  Which PAGE did you choose? 3
????????????????????????????????????????????
```

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X                                              X
X   Find page  3                               X
X                                              X
X                                              X
X                                              X
X                                              X
X                                              X
X                                              X
X   HOW MANY WORDS DO YOU WANT?                 X
X                                              X
X                                              X
X   CHOOSE A NUMBER BETWEEN 1 AND  16          X
X                                              X
X                                              X
X   NUMBER OF WORDS ->  7
X                                              X
X                                              X
X   (0) to quit.                               X
X                                              X
X                                              X
X                                              X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Say each picture name.

Print the letter that stands for the beginning sound.



^^^ BEGINNING CONSONANTS ^^^

Page 3

ROW (1) PICTURE 1

Spell the word. TOP GOOD!

Type the letter that stands for
the beginning sound. T GOOD!

USE THE WORD IN A SENTENCE.

->MY TOP IS NEW.

GOOD
Press <ESC> to QUIT - <RETURN> for more

^^^ BEGINNING CONSONANTS ^^^

Page 3

ROW (1) PICTURE 2

Spell the word. X NUT

Type the letter that stands for
the beginning sound. X N

USE THE WORD IN A SENTENCE.

->WHO ATE THE NUT?

GOOD
Press <ESC> to QUIT - <RETURN> for more


^^^ Page 3 Answers ^^^
TOP NUT CAN TEN
PIG COAT TIRE MASK
NOSE PEN MOON COW
MOP TENT PEAR NEEDLE

```
^^^ SELECTION OF ITEMS ^^^

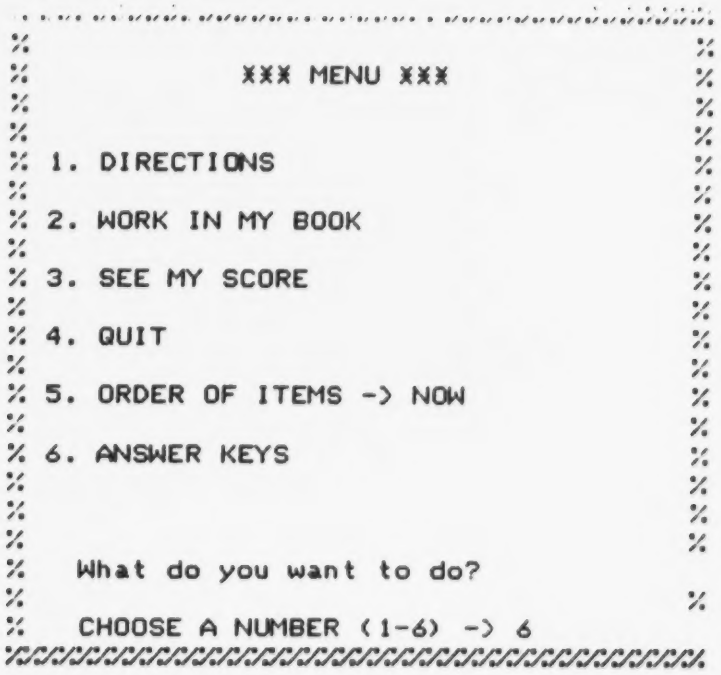
DO YOU WANT THE QUESTIONS:

IN ORDER (1,2,3,etc.) -> CHOOSE 0

MIXED UP (4,1,10,etc.) -> CHOOSE 1

SELECT A NUMBER -> 0 or 1 1

Items will be mixed up!
CURRENTLY SET AT  1
```


XXX MENU XXX
1. DIRECTIONS
2. WORK IN MY BOOK
3. SEE MY SCORE
4. QUIT
5. ORDER OF ITEMS -> NOW
6. ANSWER KEYS
What do you want to do?
CHOOSE A NUMBER (1-6) -> 6

```
      ^^^ Page Selection ^^^

 1.73      8.80      15.87     22.94
 2.74      9.81      16.88
 3.75     10.82      17.89
 4.76     11.83      18.90
 5.77     12.84      19.91
 6.78     13.85      20.92
 7.79     14.86      21.93

  WHICH PAGE DID YOU CHOOSE? 73
  CHOOSE A NUMBER (1 - 22) -> 1
```

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X                                            X
X   Find page  73                            X
X                                            X
X                                            X
X                                            X
X                                            X
X                                            X
X                                            X
X   HOW MANY WORDS DO YOU WANT?               X
X                                            X
X                                            X
X   CHOOSE A NUMBER BETWEEN 1 AND  16        X
X                                            X
X                                            X
X   NUMBER OF WORDS ->  9                    X
X                                            X
X                                            X
X   (0) TO QUIT.                             X
X                                            X
X                                            X
X                                            X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

```
          ^^^ VOWEL SOUNDS ^^^

                                Page 73
ROW (1)  PICTURE 1

Spell the word. X                CHAIN

Number of vowel LETTERS? X                2

Number of vowel SOUNDS? X                 1

FIRST vowel (long or short)? X     LONG

Type the vowel letters. X          AI

  ^^^ USE THE WORD IN A SENTENCE ^^^

 -> I LOST MY CHAIN.

GOOD

   <ESC> to QUIT -  <RETURN> for more
```

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X                                        X
X       ^^^ LONG VOWEL SOUNDS! ^^^       X
X                                        X
X Can you spell the long vowel sounds?   X
X                                        X
X                                        X
X                                        X
X                                        X
X Long A  a+e  ai  ay                    X
X                                        X
X Long E  e+e  ee  ea                    X
X                                        X
X Long I  i+e  ie  _y                    X
X                                        X
X Long O  o+e  oa  ow  oe  _o            X
X                                        X
X Long U  u+e  ui  ue  oo  oe            X
X                                        X
X Short  _a_  _e_  _i_  _o_  _u_         X
X                                        X
X                                        X
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Say each picture name.

Listen for the vowel sound.

Trace ă or ā to show the sound you hear.



Circle the pictures whose names have the ā sound.

Put an X on the pictures whose names have the ă sound.



```
%%%
```